

Advanced Manufacturing Technologies (AMT): 3D Print Element

Game Changing Development Program | Space Technology Mission Directorate (STMD)



ABSTRACT

To prepare for a future when parts can be printed on demand in space, NASA's Marshall Space Flight Center in Huntsville, Ala., and Made in Space of Mountain View, Calif., have partnered to develop and launch the first 3D printing experiment to the International Space Station. The 3D printing experiment aboard the space station will implement the first device used to manufacture parts in space. The printer uses extrusion additive manufacturing, which builds objects layer by layer out of Acrylonitrile Butadiene Styrene (ABS) plastic, the same material that is used to manufacture a Lego® brick) and other materials. More than 20 parts will be printed from computer-aided design files loaded on the printer with the ability to uplink additional files from Earth.

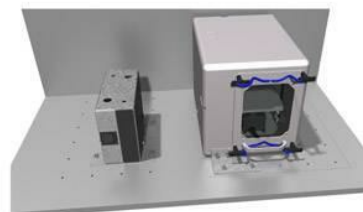
ANTICIPATED BENEFITS

To NASA funded missions:

The 3D printer effort is a shared investment between NASA's Human Exploration and Operations and the Space Technology Mission Directorates, which together seek to innovate, develop, test and fly hardware for use in NASA's future missions.

DETAILED DESCRIPTION

MIS, Inc., under SBIR Phase III contract with NASA, will build a 3D printer that can build objects out of plastic feedstock. NASA will provide insight to ensure that the design and materials meet flight certification (safety, interfaces, and operability) requirements as well as performing qualification and performance testing. The 3D Print payload will demonstrate melt deposition modeling additive manufacturing in a consistent microgravity environment. Lessons learned from this technology demonstration will be incorporated into future generations of advanced manufacturing technology for space applications.

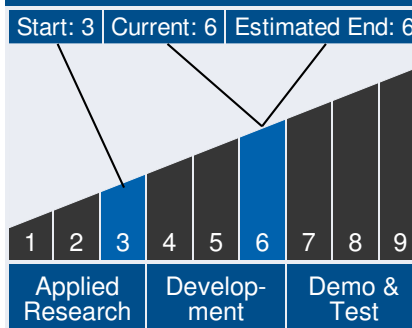


3D Printer hardware

Table of Contents

Abstract	1
Anticipated Benefits	1
Detailed Description	1
Technology Maturity	1
Management Team	1
U.S. Work Locations and Key Partners	2
Technology Areas	2
Image Gallery	3
Details for Technology 1	3

Technology Maturity



Management Team

Program Executive:

- Ryan Stephan

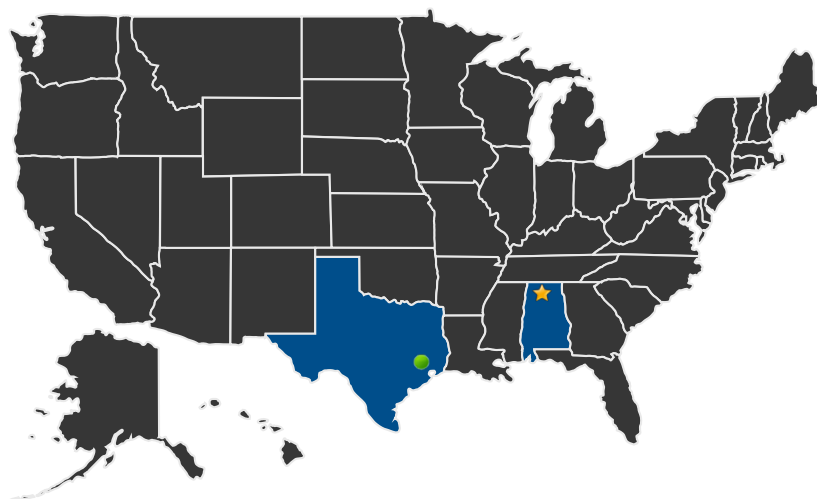
Continued on following page.

Advanced Manufacturing Technologies (AMT): 3D Print Element

Game Changing Development Program | Space Technology Mission Directorate (STMD)



U.S. WORK LOCATIONS AND KEY PARTNERS



■ U.S. States
With Work

★ **Lead Center:**
Marshall Space Flight Center

● **Supporting Centers:**

- Johnson Space Center

Contributing Partners:

- Made in Space

ELEMENT LIBRARY

News Stories

- 3D Print video: <http://go.nasa.gov/QFDI60>
 - (<http://go.nasa.gov/QFDI60>)

Management Team *(cont.)*

Program Manager:

- Stephen Gaddis

Project Manager:

- John Vickers

Principal Investigator:

- Lanetra Tate

Technology Areas

Primary Technology Area:

Ground and Launch Systems (TA 13)

└─ Operational Life-Cycle (TA 13.1)

└─ Logistics (TA 13.1.4)

└─ Additive Manufacturing as Replacement for Original Equipment Manufacturer (OEM) Spare Parts (TA 13.1.4.3)

Additional Technology Areas:

Materials, Structures, Mechanical Systems and Manufacturing (TA 12)

Advanced Manufacturing Technologies (AMT): 3D Print Element

Game Changing Development Program | Space Technology Mission Directorate (STMD)



IMAGE GALLERY



3D Printer hardware

DETAILS FOR TECHNOLOGY 1

Technology Title

Advanced Manufacturing Technologies: 3D Print

Technology Description

This technology is categorized as a hardware system for manned spaceflight

The 3D Print experiment will demonstrate the capability of utilizing additive manufacturing technology in space. Additive manufacturing is a way of printing three-dimensional (3D) components from a digital model. If you think of a common office printer, it takes a 2D file and prints it on a sheet of paper. A 3D printer will take a 3D file and by depositing thin layers of material on top of each other creates a 3D model giving us the ability to print tools on demand.

Capabilities Provided

This technology demonstration is the first step towards realizing an additive manufacturing, print-on-demand "machine shop" for long-duration space missions and sustaining human exploration of other planets, where there is extremely limited ability and availability of Earth-based logistics support.

Potential Applications

The ability to 3D print parts and tools on demand will dramatically reduce the time it takes to get parts to orbit and increase the reliability and safety of space missions, while dropping costs.